DOCUMENT RESUME

ED 478 390 SP 041 652

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TITLE	Do-It-Yourselfers or Engineers? Bricolage as a Metaphor for Teacher Work and Learning.
PUB DATE	2003-04-00
NOTE	15p.; Paper presented at the Annual Meeting of the American Educational Research Association (84th, Chicago, IL, April 21-25, 2003).
PUB TYPE	Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE	EDRS Price MF01/PC01 Plus Postage.
DESCRIPTORS	Classroom Techniques; *Faculty Development; Learning Strategies; Secondary Education; *Teacher Improvement; *Teacher Student Relationship; Teaching Conditions
IDENTIFIERS	Student Engagement

ABSTRACT

This study explores the nature of teacher learning within the broader context of increasing state-level accountability, applying Levi-Strauss' bricolage metaphor to teachers' workplace learning. Based on the assumption that "problems of practice" serve as catalysts for learning, it addresses how teachers define and solve problems in their work (i.e., what resources and strategies are employed and why). The study examines data from three high schools that participated in an exploration of teacher workplace learning. Data were collected over 2 years from teacher interviews, observations, and focus groups. The relationship between teacher work context and challenges was evident at each school. As the context varied, so too did problems encountered, though problems differed more in degree than type. Two aspects of the teacher-student relationship shaped teachers' work context: the challenge of engaging students with the content regardless of students' interests and backgrounds and balancing student engagement and student control. The manner in which teaches addressed challenges suggested that in many ways they did work as bricoleurs. Most challenges were dealt with in the moment, requiring reflection-in-action. Teachers were multifaceted learners and problems solvers, often drawing from multiple learning experiences to resolve challenges. Teachers engaged in learning activities that helped them theoretically frame the challenges they faced. (Contains 11 references.) (SM)

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RUNNING HEAD: Do-it-yourselfers or Engineers?

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Do-It-Yourselfers or Engineers?: Bricolage as a Metaphor for Teacher Work and Learning

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Paper presented at the American Educational Research Association annual meeting, Chicago, IL, April 21-25, 2003

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Do-It-Yourselfers or Engineers?:
Bricolage as a Metaphor for Teacher Work and Learning

The "how" and "what" of teacher learning has been the subject of debate in policymaker and practitioner circles for at least the past decade. Recently, scholars have argued that teacher learning should focus on closing the gap between teachers' knowledge and student performance goals (Hawley & Valli, 1999), strengthening teachers' understanding of the connections between content and students' thinking (Thompson & Zeuli, 1999), and creating a tighter organizational fit between teacher learning activities and teacher work (Little, 1999). Others have argued for the importance of understanding the relationship between the nature of teacher work and teacher learning (Grant & Sleeter, 1987; Scribner, 1999). Inherent in the scholarship on teaching—and more specifically teacher learning—is the tension between teachers-as-craftspeople and teachers-as-technicians. Current trends at the state and federal levels in the US suggest that those who judge teachers and their work increasingly view teaching as a scientific—i.e., technical—endeavor.

The purpose of this study is to explore the nature of teacher learning within the broader context of increasing accountability from the state level. Specifically, the paper applies Levi-Strauss' bricolage metaphor to teachers' workplace learning and explores the teachers-as-bricoleur/engineer dichotomy. Based on the assumption that "problems of practice" serve as catalysts for learning, the following research questions were addressed:

1) How do teachers define "problems of practice" in their work?
2) How do teachers go about solving these problems of practice (e.g., what resources and strategies are employed and how)?

The discussion section addresses the question: Given how teachers perceive of and address problems of practice, what implications for policies and practices for teacher learning should be considered within the context of increased emphasis on teacher quality and measurable student outcomes?

Theoretical Framework

Teacher workplace learning is a complex notion and a difficult phenomenon to isolate and study. Others have evaluated professional development programs as a way to examine teacher learning, others have examined on the job learning, and still others have speculated on the roles of various organizations (districts and schools) and educational leaders (superintendent and principals) play in the teacher learning process. The present study emerges from a research program that has been exploring the relationship between the context of teacher work and teacher learning for several reasons.

Scribner (1999, 2003) has asserted that teacher work influences in important ways how teachers learn. The hot action of teacher work compels teachers to focus on and favor certain learning activities to the exclusion (or at least tolerance) of others. In fact, the nature of teachers' work across rural, urban and suburban contexts seems to force

teachers to rely primarily on learning through individual and isolated experiences and intermittent interactions with select colleagues—this even in schools claiming to be professional learning communities. In fact, creating workplace communities in which teachers truly feel free to open themselves up to critique by other professionals has been intermittent and dubious at best (Scribner, Hager & Madrone 2001). In spite of these challenges to learning, teachers do learn, their students learn, and problems of practice are often resolved, leading to improved learning environments, at least within the confines of the classroom.

This notion is supported by research that has shown that teachers' work context is primarily defined by a tripartite relationship between teacher, student and subject matter (Scribner, 2003). In short, students and subject matter serve as catalysts for teacher learning. The question remains, however, *how* do teachers respond to the catalyst? It is with this thought in mind that we turn our attention to the "bricolage" metaphor. Levi-Strauss (Levi-Strauss, 1966) introduced the concept of bricolage as the art of creating with what is at hand. The bricoleur is a do-it-yourselfer who does not look for (or does not have available) new tools to address a project, but rather uses what he or she already has available. Thus, the bricoleur practices a combinatorial art, constantly arranging and rearranging available materials and resources. The bricoleurs "tools" are collected not with some specific use in mind but with the hope that one day *they will be useful*. Thus, the bricoleur's means are the direct result of past experience, and those means are heterogeneous and finite. The bricoleur's means are heterogeneous because each element (i.e., tool) has a variety of uses, and they are finite because she does not, except by chance, add to her "tool kit." In other words, the bricoleur's response to the task at hand is limited to a rearrangement of the existing means (Hatton, 1989).

Levi-Strauss contrasts the bricoleur with the engineer. As opposed to working with images and understandings that are linked to past experience, engineers work with concepts that are "transparent to reality" (Wiseman & Groves, 2000). The engineer is concerned with concepts, working from plans and anxious to get the structure right (Caws, 1970). That is, the engineer is "always trying to make his way out of and go beyond the constraints imposed by a particular state of civilization while the 'bricoleur' by inclination or necessity always remains within them" (Levi-Strauss, 1966, p. 19). Mercel (1998) distinguishes the engineer as a professional who is project driven. As such, the engineer seeks the systematic transformation of her surroundings based on rigorous methods that are grounded in theoretical knowledge. Furthermore, the elements the engineer utilizes are generally specific, predictable, and available in the necessary form (i.e., they are in their intended state).

So, whereas the bricoleur works with what is immediately available and acquires new knowledge by happenstance, Levi-Strauss theorizes that the engineer is on a quest to develop new tools (e.g., concepts and theories) to solve problems. But the bricoleur "does not have a framework of a coherent project" (Mercel, 1998, p. 145). As Mercel states, for the bricoleurs it is always a question of an occasional, limited intervention" (p. 149). In addition, the bricoleur's work does not require a specific [i.e., professional] knowledge, and the materials used are not specific as the bricoleur reuses and modifies the use of the

materials he finds, which were often meant for purposes other than their ultimate use. Finally, the results of the bricoleurs work are uncertain, never identical, and thus difficult to reproduce. As Caws (1970) puts it: "the bricoleur is a handyman, the tinkerer, who gets surprising practical results from the most unlikely material" (p. 202). In light of these definitions, however, it is important to consider that bricoleurs and engineers represent problem-solvers, not on a hierarchy, but on two separate paths (Mercel, 1998).

Weick (2001) and others (Harper, 1987) have argued favorably for the attributes of bricolage. Applying the metaphor to organizations, Weick argued that bricoleurs have an advantage over engineers because whereas engineers take on only those projects for which they have the necessary raw materials and resources, bricoleurs are limited only by their own creativity. Harper (1987) argued that the bricoleur's creativity stemmed from continual considering and reconsidering, "always with a view to *what is available*, what is at hand" (p. 74, emphasis in original).

Methods

As part of a larger study that explored teacher workplace learning in nine high schools, the present study examines teacher data from a subset of three high schools in one mid-sized city (population 90,000). The school districts student population was approximately 16,850. High schools from the same district were selected to achieve a variety of school contexts, but to also maintain some broader organizational consistency. Two of the high schools were large comprehensive high schools (student populations of 3,000 and 1,700). The third high school was an alternative school with 250 students. Data collection and analysis occurred over two academic years and involved several stages. Using in-depth interviews, data were collected from 26 teachers (from a variety of subject areas, but primarily including core academic subjects and the fine arts). Ten teachers from each of the larger high schools and 6 from the alternative high school were studied. Teachers were purposively selected for representation across content areas, years of teaching experience, and gender. Teachers from core academic areas were selected because these are the subjects tested in the state's accountability program. Teacher interviews focused on teachers' perceptions of their work environments and their learning and problem solving strategies. Interviews lasted from 45 minutes to 2 hours. Third, observations of teachers at work and in learning activities were also conducted. In each school 2 of the interviewed teachers were shadowed for 3 days each; impromptu interviews occurred with these teachers throughout shadowing to explore teachers thinking. Finally, informed by individual interviews and observations, one focus group interview with previously interviewed teachers was conducted at each school to further explore emerging propositions.

Findings

The Context of Problems

The relationship between teacher work context and the challenges teachers faced was evident at each school. As the context of each school varied, so too did the problems that

manifested themselves to teachers. However, these problems differed in degree more than in type. Challenges emerged to teacher practice within a context that was bounded by teachers' relationships with students and their content knowledge (Scribner, 2003). Thus, it was the relationship between teachers and students that was the defining characteristic of teacher work context and contributed to perception of teachers as bricoleurs. By being so firmly situated (and isolated) in their primary work context, teachers problem solve with little opportunity to distance themselves from the challenges they face. Therefore, the learning strategies chosen tend to focus on the most immediate sources and opportunities (Scribner, 1999). In the sections that follow, we will see how teachers primarily acted as bricoleurs, but at times showed evidence of approaching problems as would an engineer.

Clearly, schools possess their own contexts in spite of strands of organizational culture that run through districts. These differences in school context illustrated how context shapes what exactly is a problem of practice. In spite of the varying contexts across each case study school, some elements of context remained fairly constant. Commonalities across schools were two-fold. First, the teacher-student relationship presented opportunities and challenges to teachers. Second, contexts varied teacher by teacher (within and between schools), as the challenges teachers faced required teachers to draw on specific knowledge and skills. The extent to which teachers had the skills and knowledge to confront challenges determined 1) how they saw and interpreted their context, and 2) and their strategies for problem solving. In short, both of these points suggest that teachers—and thus their knowledge and skill—are inextricably linked to their contexts, and therefore, teachers draw on what they have to deal with issues that they face.

While other studies that explore the context of teacher work have developed broader descriptions of context, the focus on problems and problem solving in the present study led to a much narrower definition. In this regard, the teacher-student relationship is the defining characteristic of context. In particular, the data showed that two aspects of this relationship shaped teachers work context: 1) the challenge of engaging students with the content regardless of students' interests, background, etc. and 2) balancing student engagement and student control (i.e., classroom management).

The work of engaging students

Perhaps surprisingly, these high school teachers first and foremost were concerned not with delivering content, but with connecting with their students. Furthermore, to the extent that the teacher-student relationship posed a problem to effective practice, teachers described it as their problem to solve, not a problem to project on students. Several teachers described this approach to their work as a continuing journey, one that began "teaching stuff to students" but that had evolved into "teaching students stuff."

> I got into teaching thinking—probably like most people have been conditioned to by their experience as a learner—that teachers teach stuff to students. And I have learned that really it's teachers teaching students stuff. We don't really get trained

very much as high school teachers on how to teach students; we get trained on how to teach stuff. And that's a terrible problem.

I: So what does it mean to you to teach students?

It means that you cannot start any instructional session or even any planning for an instructional assignment predicated just on the content that the class is supposed to be about. That it has to start out a little bit with that, and you have to know enough about that to be able to make good decisions about what's worthwhile as a context for learning from the content that you're supposed to be using. Then you have to see whom your clientele is and what you're supposed to accomplish with those students. Because the content is going nowhere. It's only the students that are going somewhere if you can help them with that.

An English teacher described how students are the focal point and her challenge is to develop efforts are concentrated on developing strategies and approaches to engage her students with the content:

Well, probably, there's more of an emphasis on pedagogy, as far as my own learning, and that is how to deliver that same old thing—and really it's the same old thing that I tried to deliver long ago. It's still reading, and it's still thinking, and it's still writing. It's all those things, and in some cases, it's some of the same works, but I think it's how we deal with delivering that to contemporary students. And I'm not one who thinks students have changed all that much, although I do think there is a difference in students now than when I began. But I think that our emphasis is on different things and strategies and discussing things, and there's a huge emphasis on group work, for example. And I'm interested in those sorts of things, on how we can get more out of our students, how we can communicate better with our students. I think there's more of an emphasis on the student as an individual than there was.

While teachers defined context narrowly, this did not mean that they oversimplified the concept. Teachers, unlike many of their critics, see a complex, multi-faceted and multi-layered context. By acknowledging the diversity of learners in their charge, teachers complicate the context of teacher work enormously and greatly increase the knowledge and skills teachers need to connect with and nurture the development of myriad students. Furthermore complicating their context, teachers were equally concerned with social aspects of student development. Unlike the constant din of conversation surrounding achievement, test scores and accountability, teachers were in a constant state of learning to address the social, as well as the cognitive, learning needs of students. As one teacher eloquently put it. "I tend to see myself as a traffic cop and these kids are going through a real dangerous intersection [in their lives]."

Another English teacher stated:

> I know my students; I make the effort. You're not always successful. Sometimes it comes back a year or two later. The kid that was a little butthead and you can't work it out you have this personality thing and then they come back and they're your star student, or they come and visit you for years after they graduate when there was a point you never wanted to see them again.

Balancing student engagement and control

The second defining feature of this teacher-student relationship was addressing the challenges posed by classroom management. Teachers at all three schools discussed the problem that maintaining classroom discipline posed to them, especially in light of their efforts to connect with students. For most teachers at each of the case study schools, classroom management arose as a result of the broad diversity of learners. One teacher described the importance of connecting with students first in order manage students in the classroom, "I have a pretty firm basis as far as discipline issues. If a student feels connected with something, basically me, it's really difficult to go on with anything in the classroom that's meaningful."

A social studies teacher at another high school described the culture of his school to students and the attempts made to treat students like "emerging adults":

> Well, it's complicated, so I don't know if I can explain it. The whole business about tardies. Every year that I've been here we have this fairly lax—in the eyes of some people—there have been those who teach here that are just driving everybody else nuts about kids being in class on time. And for years, that used to come up in summer staff retreats. And finally we stopped having retreats, because a lot of us stopped going because we didn't want to listen to certain people bitch about tardies or about cutting kids hands off, figuratively-speaking, for this infraction or that infraction....So we have a lot of pressure to create more rules about tardies. And so this year, for the first time since I've been here, we initiated and we adopted it last spring, a policy where basically you're going to get the loss of your unassigned time. That that's going to be deprived from you on a sliding scale for disciplinary infractions about truancy or about tardies or whatever, that you're going to lose your unassigned time, either for a certain number of days or maybe for the entire school year if it's a repetitive infraction. And that there's no negotiation here. If it happens, we cut your hand off one knuckle at a time. And that is very different than the policy that we've had before.

While teachers across schools described their efforts to connect with students as an antecedent condition to teaching, learning, and classroom management, the context of the alternative high school revealed some additional challenges facing those teachers. As a math teacher new to the school stated:

> Classroom management was the first obvious challenge that just blew me away in the beginning. And it still is.... It's so different here than my student teaching experience. Nothing is the same here; everything I learned in college was

completely out the window when I came here. The rules just didn't apply. So, basically, I've had to learn everything all over again and completely change it to this particular school because it is so incredibly alternative.

He continued to describe the school's climate vis a vis classroom management and discipline:

> Even classroom management is completely alternative here. [Students] are allowed to walk around whenever they need to. If they need to leave class because they're gonna blow up, they're welcome to do that. They have smoke breaks, the whole nine yards. So, I just had to watch other teachers. The traditional approach to classroom management's just not gonna fly. No. In fact, that has the negative effect, the opposite.

Another thematic difference between teachers at the two comprehensive high schools and the alternative high schools was the degree to which the alternative high school teachers described their role as impromptu counselors or social workers as a result of the challenges they and their students faced. A teacher at the alternative high school believed that teachers at the school had a handle on content knowledge, the organizational demands of running a school, but were often challenged to meet students' non-academic needs:

> I think that we do a really good job of [teaching and running this school]. Our teachers work together to put together interdisciplinary units to talk about things that are of concern to them whether it be subject matter or discipline and behavior, so I don't really see that as a problem in their major content areas. I think they have the knowledge they need. Now as far as going into those areas of drug and alcohol abuse, dealing with the disruptive students, the gang related things, I think we need help there. And helping students with their careers.

Defining problems of practice

Bricoleurs and engineers do not necessarily address different problems, but they do, according to our framework, address problems differently. Challenges to practice presented themselves in several different ways. As a phenomenon, problems of practice were often vexing in that their cause was uncertain and the solution less so. From day to day and month to month solutions to similar situations may or may not work. Yet, generally speaking, problems flowed out of the contextual characteristics described above. The range and nature of challenges to teacher practice shaped how teachers described and addressed those challenges.

Thus, while teachers knew that their primary challenge was to engage students and maintain some level of guided learning and control, the context—primarily manifested in the relationships between teachers and students—was constantly changing, making it difficult to address challenges that came up in any systematic way. The fluidity of teachers work context is unlike most situations facing other professions (e.g.,

engineering) where situations are typically better defined, more predictable, and relatively constant. As one teacher described, the challenges change with each group of students, even each student, on any given day:

> And that's a different story every class period with every group of learners if you want to create a community of learners of which you are a part...and nobody knows exactly what that looks like on any given day. So there's a lot of ambiguity there, and you have to have a real repertoire of sensitivities and skills as well as content knowledge to be able to react appropriately and make use of what's put on the table for you in terms of the kids and where you are.

Across schools, however, teachers did talk differently about their contexts as they related to teacher-student relationship. For example, the challenge of maintaining learning environments in the classroom was a pervasive topic of conversation among teachers at the alternative high school. Data from the alternative high school was rife with immediate challenges to teachers' sense of efficacy. Teachers also described the challenge of how to maintain student engagement with such a wide range of student ability levels present in any one class. Not that teachers were successful, but the problems of achieving and maintaining student engagement with the material, addressing a broad diversity of learning abilities placed teacher problem solving in fairly continuous state of decision making in the hot action of teacher work. However, the extent to which teachers described the challenges of engaging students or managing the classroom differed by school. Data showed that the comprehensive high school teachers spent more time discussing their efforts to find ways of engaging all students. While the emphasis of data collected from alternative high school teachers focused more on classroom management challenges. For instance, the flavor of much of the conversations with teachers (especially after observations) was spent discussing how to motivate students who "were at their last stop" in public schools. A teacher from the alternative high school stated:

> If they don't like the teacher, I don't care what the heck the method is, they're going to have a harder time responding, especially our kids. Now a teacher with a bland personality but with a great method I'm sure with advanced kids, that's fine, they learn in spite of the teacher.....They have different motivators. You have to find different ways to motivate them and it's not always pedagogy, it's personality and you hope that you mix the two.

Another teacher from one of the comprehensive high schools described the motivation challenge this way:

> Well, again, with the different levels of students that you deal with, I think that has a lot to do with it. With one level of students, you are constantly having to improve yourself just with the knowledge base, so you can challenge that student more. On the other end of that spectrum, the techniques that are going to be necessary to motivate a student that is not highly motivated or that has a different

learning style is certainly, well, how do you; you have two different approaches that you do there.

Learning Strategies

Combined with our understanding of how these teachers perceived of challenges to professional practice, the manner in which they addressed them suggested that in many ways they did work—at least most of the time—as bricoleurs. Data suggested that most challenges were dealt with in the moment, requiring at best reflection-in-action. Given that teachers and the challenges they faced were deeply embedded in the context of their work the opportunity for reflection and the acquisition of new "tools" or knowledge to address the challenge was not realistic. But data also showed that given these constraints teachers were multi-faceted learners and problem solvers often drawing from multiple learning experiences (both recent and distant past) to resolve these challenges.

As explained above, challenges to teacher practice presented themselves as acute (needing immediate attention), chronic (issues to be dealt with but not necessarily immediately), and anticipatory (not yet challenges[CoE1]). Teachers focused their learning on pedagogy, content, students and their culture, and ways of connecting these three learning foci. In dealing with acute and chronic challenges, teachers sought to learn in direct response to challenge. Thus, the learning typically was informal, localized, and reactive.

This approach to learning caused teachers to rely on certain learning strategies to the exclusion of others. In addition, the time sensitivity of most challenges caused teachers to seek the quickest and most accessible learning strategies—in other words to act as bricoleurs who must used what was at hand to solve a problem. They used a variety of sources to inform their teaching and address challenges they face. In response to immediate and chronic problems, teachers in this study—especially more novice teachers—described the use of an informal apprenticeship model in which they observed colleagues. Often, this type of observation was passive with little formal communication and reflection occurring between teachers. Teachers described the application of knowledge gained through trial and error as a more common problem solving approach.

Some teachers also experienced active learning through sharing with colleagues. In one school in particular, several of the participating teachers were observed working in content areas teams where information about acute challenges was shared on a regular basis and strategies for problem resolution were shared. In spite of team structures at other schools, less time was spent in these meetings and less specific, student focused information appeared to be shared. Another problem solving strategy was to rely on past experience as a guide to how to address present situations. The primary way that teachers addressed challenges to their practice was through informal learning. Much of this learning took place alone, through passive observation, and through informal (often chance) interactions with colleagues. Occasionally, teachers described formal learning settings and activities as a useful means for addressing challenges to their practice.

In response to anticipated challenges teachers engaged in much more methodical knowledge-building activities for more general purposes. In a sense, they warehoused information—again focusing primarily on issues related to pedagogy, content, and students in general. The knowledge, skills, and information gathered were done so in order to improve their ability to address unforeseen challenges and to better understand their context defined primarily through teacher-student relationships. This approach to problem solving—strengthening one's capacity to address unforeseen problems—focused on the accumulation of both procedural and declarative knowledge.

Interestingly, similar to our description of the engineering approach to problems, teachers engaged in learning activities that assisted them in theoretically framing the challenges they faced. For instance, in contrast to their own assumptions that they preferred practical knowledge to declarative knowledge, teachers spent a considerable amount of time reading theory and research on issues related to pedagogy as it related to teaching specific content and classroom management. For example, many teachers described reading in areas directly related to content and to some extent pedagogy. Several teachers, especially social studies and teachers of literature spent their time building their knowledge base through reading literature, leading newspapers, and academic journals. In this realm of knowledge and skill building teachers tend to speak of their learning in more reflective terms. The following comment exemplifies this idea. This teacher showed a bricoleur-in-action as she described how she read the New Yorker on the chance she might find something applicable to her teaching. As she stated, she "reads things that don't have very much to do with my teaching...because you never really know when there's going to be some relation to that":

> Well, partly, just by keeping up with things. And I read the New Yorker largely because it's an example of discipline. It's deep writing. The topic is in-depth, and it's what I want my students to strive for. And I'll bring those to school when I'm finished with them, and they like to read those. And I just like to have them be exposed to that sort of magazine. Newspaper, mostly just keeping up on what's going on. And I have used the editorial pages many times for examples of persuasive writing or not, opinionated pieces, the viewpoint pieces and that sort of thing. We discuss that particularly in the composition class.

Teachers described a careful splicing and pruning of knowledge from various sources as that knowledge needed to be revised and corrected. They often described reading out of their field and reading primary sources of "giants" in their disciplines. As one teacher explained, he did this in order to meet the needs of his students as they too struggled with the content. Interestingly, teachers in the fine arts also described deepening their understandings of their subject areas, but they described the actually practice of the medium in an effort to strengthen their skills.

Whether learning is focused on an immediate challenge or a chronic problem, teachers described a process that relied on multiple sources to build knowledge and skills. The sources varied depending on individual teacher context and experience and the resources available at any given moment. In short, the learning was often serendipitous and

opportunistic. For example, this teacher described how she and her colleagues made use of elements of past reform efforts:

> Here in an alternative setting, we tried it all, we tried outcome based, we tried a lot of that type of thing. We tried outcome based, our school went to outcome based, seven or eight years ago, we decided that wasn't the best thing for us. However, any good teacher uses a lot of the principles of outcome based just in their everyday or every unit teaching they should use outcome-based principles. So we didn't go as a wholehearted philosophy, though, but I think that we use a lot of the principles even now. However, I think we have a little more rational way of going about it.

The above comment suggested that teachers assimilate various learning strategies, melding together past experiences to address current problems. Teachers are in a constant state of transforming knowledge to make that knowledge relevant to their context. They keep bits of things that work and throw out what doesn't (maybe they tuck it away somewhere instead of throwing it out).

Another teacher described how she collected information and tools for teaching throughout her career, each step assessing, pruning and splicing ideas, as she found what works best for her students:

> There are always some little short tidbits, I guess you'd say, or suggestions that I have picked up and used. One that comes to mind was an idea about portfolio assessment.... I use an alternative assessment. And there are all different kinds of ways to do that. I'm still working on how to configure that particular kind of assessment for kids. And there have been some practical ideas on which things work best with that.

Another teacher provided an example of the bricoleur-in-action. In this quote is would seem that it's not the problem that is perplexing, but the solution that is illusive and leads to a lack of confidence:

> It depends on where I'm seeing a problem. If I'm having problems with a student with discipline, and I see an article that's about discipline, then I would probably read that and try to apply some of it. If I'm worrying about how I'm teaching writing, if I'm doing the most effective job, then I start looking for articles about writing, and that's sort of what, that's where I am in my teaching, usually that dictates what I choose to read, and it's usually it's what I need to help my classroom be better.

In each of these examples teachers were engaged in a process of pruning and splicing knowledge and skills from various experiences (learning experiences, work experiences, etc) to form a knowledge base to solve problems.

SIGNIFICANCE OF THE STUDY

If not false, the findings from this study suggest that the bricoleur/engineer dichotomy may be oversimplified as it relates to teacher learning and problem solving. Teachers indeed do act as bricoleurs in many cases as they confront problems that are deeply embedded in the context in which they work. However, problems also present themselves as chronic or anticipated issues to resolve. In these cases teachers engage in learning activities that suggest a more detached, theoretically grounded approach to learning.

In cases in which teachers act as bricoleurs, they address problems of practice within the hot action (Eraut, 1994) of the classroom using the "science of the concrete" (Harper, 1987; Wiseman & Groves, 2000) the they have perfected (or improved upon) through experience. That is, teachers survive by "adapting the bricoles [i.e., odds and ends] of the world" (Harper, p. 74). Thus, Levi-Strauss' bricolage metaphor is a useful way challenging emergent notions of teacher quality that arise out of accountability programs at state and local levels that presume teachers need to change in order that students might meet, "proficient" levels, but are not quite certain *how* teachers should change. However, it is important to note that it is the nature of the problem that seems to determine how teachers work to solve it, not vice versa. When practical, teachers do expand their "toolbox" by extending outside their existing knowledge base bringing in knowledge and concepts from outside the boundaries of their context.

By examining teacher learning explicitly through problems of practice, several implications for the practice of teacher learning in schools seem apparent. First, the silence of issues related to accountability and other state driven educational reform initiatives was deafening. Given the opportunity to discuss those challenges (broadly defined) to their practice, the vast majority of teachers in this study homed in on the teacher-student relationship and it complexity. Furthermore, teachers only rarely suggested that formal staff development activities were helpful in resolving these challenges. While the design of this study limits the ability to generalize, it is fair to say that when it comes to teacher learning schools and districts should consider the important role that informal learning strategies play. Strategies such as in school teacher learning that allows for observation of peers, study groups, and individual time for reflection and research are valuable. These practices should not be impeded by bureaucratic demands for measurable outcomes such as continuing professional education hours. In addition, organizers of professional learning activities—be they district officer personnel, school administrators, or teachers—should ensure that the majority of teacher learning time is focused squarely on teacher-defined problems of practice as those problems relate to the tripartite relationship of teachers, students and content.

In the current reform climate created by the new *No Child Left Behind* Act, there appears to be little room for creativity where that creativity cannot be measured scientifically—a la the engineer. But this paper argued that rather than thinking of teacher as either engineers or bricoleurs, both metaphors are useful for thinking about teacher learning policy and practice. For the teacher-as-bricoleur reflects how teachers survive and learn on a daily basis those things needed to accomplish quotidian tasks. However, the

perspective of the engineer is also useful and congruent with notions of teachers as professionals. That is, that teachers should be open to researching, developing and adapting to their practice new ideas and practices whose origins lie outside the confines of their own professional worlds.

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